780 CMR 53.00

BUILDING PLANNING FOR SINGLE- AND TWO-FAMILY DWELLINGS

780 CMR 5301 DESIGN CRITERIA

5301.1 Design. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads as prescribed by 780 CMR 51.00 through 99.00. The construction of buildings and structures shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation.

5301.1.1 Alternative Provisions. *As an alternative to the requirements in 780 CMR 5301.1 the following standards are permitted subject to the limitations of 780 CMR 51.00 through 99.00 and the limitations therein. In lieu of prescriptive compliance, where engineered design is used in conjunction with these standards the engineered design shall be performed by a Massachusetts-registered professional engineer or architect, employ an appropriate engineering rationale consistent with the standards below and utilize the wind and snow loads set forth in 780 CMR 51.00 through 99.00..*

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual* (WFCM).
2. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing-Prescriptive Method for One- and Two-family Dwellings* (COFS/PM).

Note that seismic design requirements are not applicable to one- and two-family detached dwellings.

5301.1.2 Construction Systems. The require-ments of 780 CMR 51.00 through 99.00 are based on platform and balloon-frame construction for light-frame buildings. The requirements for concrete and masonry buildings are based on a balloon framing system. Other framing systems must have equivalent detailing to ensure force transfer, continuity and compatible deformations.

5301.1.3 Engineered Design. *When a building of otherwise conventional construction contains structural elements exceeding the limits of 780 CMR 5301 or otherwise, not conforming to 780 CMR 51.00 through 99.00, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconven-tional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design shall be provided by a Massachusetts-registered professional engineer or architect and shall utilize the wind and snow loads set forth in 780 CMR 51.00 through 99.00.*

5301.2 Climatic and Geographic Design Criteria. Buildings shall be constructed in accordance with the provisions of 780 CMR 51.00 through 99.00 as limited by the provisions of 780 CMR 5301; ***also see 780 CMR Table 5301.2 (1)***.

5301.2.1 Wind Limitations. Buildings and portions thereof shall be limited by wind speed, as defined in 780 CMR Table 5301.2(1), and construction methods in accordance with 780 CMR 51.00 through 99.00. Basic wind speeds shall be determined from 780 CMR Table 5301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of 780 CMR 5301 for each portion shall apply. Where loads for windows, skylights and exterior doors are not otherwise specified, the loads listed in 780 CMR Table 5301.2(2) adjusted for height and exposure per 780 CMR Table 5301.2(3), shall be used to determine design load performance requirements for windows and doors.

5301.2.1.1 Design Criteria. Construction in regions where the basic wind speeds from780 CMR Table 5301.2(4) equal or exceed 110 miles per hour (177.1 km/h) shall be designed in accordance with one of the following:

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual for One- and Two-Family Dwellings* (WFCM); or

1.1 American Forrest and Paper Association *Guide to Wood Construction in High Wind Areas for One- and Two- Family Dwellings, 110 mph Exposure B.* A Commonwealth of MA version of the checklist can be used in place of the checklist at the end of the

guide. The MA version is found in Appendix 780 CMR 120.P

2. *Southern Building Code Congress Inter-national Standard for Hurricane*

4. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing-Prescriptive Method for One- and Two-family Dwellings* (COFS/PM).

5. Concrete construction shall be designed in accordance with the provisions of 780 CMR 51.00 through 99.00.

5301.2.1.2 Internal Pressure. Windows in buildings located in wind borne debris regions shall have glazed openings protected *Resistant Residential Construction* (SSTD 10); or

3. *Minimum Design Loads for Buildings and Other Structures* (ASCE-7); or

from windborne debris or the building shall be designed as a partially enclosed building in accordance with the *International Building Code* ***but utilizing the wind loads set forth in 780 CMR 51.00 through 99.00***. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and of ASTM E 1886 referenced therein.

TABLE 5301.2(1)
MASSACHUSETTS CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND SPEED[g] (mph)	SEISMIC DESIGN CATEGORY[g] (One- and Two-Family Detached Dwellings-only)	SUBJECT TO DAMAGE FROM				WINTER DESIGN TEMP[f]	ICE SHIELD UNDERLAYMENT REQUIRED[i]	FLOOD HAZARD[b]	AIR FREEZING INDEX[j]	MEAN ANNUAL TEMP[k]
			Weathering[a]	Frost Line Depth[b]	Termite[c]	Decay[d]					
Table 5301.2(5)	Table 5301.2(4)	N/A	Figure 5301.2(3)	4 ft. Minimum unless engineered data shows otherwise	Figure 5301.2(6)	Figure 5301.2(7)	Appendix 780 CMR 120.J Table 120.J3.2.1	As required by the exterior roof covering manufacturer; roof pitch and local climate must also be considered	Refer to the applicable Flood Insurance Rate Map (FIRM)	Only utilized in the design and construction of frost-protected shallow foundations	Only utilized in the design and construction of frost-protected shallow foundations

For SI: 1 foot = 304.8 mm.

a. Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The weathering index ("negligible," "moderate" or "severe") shall be determined from the Weathering Probability Map [Figure 5301.2(3)]. The grade of masonry units shall be determined from ASTM C 34, C55, C 62, C 73, C 90, C129, C145, C216 or C 652, as applicable.

b. The frost line depth shall be a minimum of 4 feet in Massachusetts unless engineering data demonstrates that the frost line depth is less than or greater than 4 feet. Under no circumstances will permanent foundation systems, required to be protected from frost be allowed set at less than 4 feet without engineering design ensuring foundation frost protection.

c. Site-specific termite conditions should be determined when possible, otherwise Figure 5301.2(6) shall be utilized.

d. Typically "slight" to "moderate."

e. The basic wind speed shall be determined from Table 5301.2(4) for the specific city or town where construction is intended.

f. See Appendix 780 CMR 120.J3.2.1.

g. Seismic design is not required for one- and two-family detached dwellings.

h. The community Flood Insurance Rate Map (FIRM) shall be utilized to establish the flood hazard.

i. The requirements of the manufacturer of the exterior roof covering shall be followed with regard to ice shield underlayment; likewise roof pitch and local climate must be considered.

j. Only utilized when one is designing a frost-protected shallow foundation. When applicable, refer to the "100-year return period air freezing index" from Figure 5403.3(2) and for further clarification view the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°Fahrenheit)" at www.ncdc.noaa.gov/fpsf.html.

k. Only utilized when one is designing a frost-protected shallow foundation. When applicable, refer to the "100-year return period air freezing index" from Figure 5403.3(2) and for further clarification view the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°Fahrenheit)" at www.ncdc.noaa.gov/fpsf.html.

780 CMR TABLE 5301.2(2) COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (psf)

ZONE	EFFECTIVE WIND AREA (feet^2)	BASIC WIND SPEED (mph—3-second gust)											
		85	90	100	105	110	120	125	130	140	145	150	170